7

WASTEWATER

This chapter provides ordinance, policy, and standards establishing minimum design criteria for constructing and modifying wastewater systems to be owned and operated by the city. It provides guidance on agreements, design report preparation, wastewater facilities, the sanitary sewer system, and final plans preparation.

Water Resources
9388 E San Salvador Drive
480-312-5685

Water Operations
9312 N 94th Street
480-312-5650

Water Quality
8787 E Hualapai Drive
480-312-8732

One Stop Shop
7447 E Indian School Road
Suite 100
480-312-2500

Current Planning
7447 E Indian School Road
Suite 105
480-312-7000

Plan Review
7447 E Indian School Road
Suite 125
480-312-7080

contents

Sections

Figures

WASTEWATER

7

GENERAL INFORMATION 7.000

A. Ordinance Requirements

Developers are required to install, at their expense, all improvements necessary to provide wastewater service to their development. This includes any sanitary sewer lines, lift stations, force mains, or other facilities, and the payment of all required development fees (Section 49-73).

Developers must also adhere to the city's requirements for extension of the city's wastewater system to newly developed areas and subdivisions inside the city's service area (Section 49-212).

The City Code is available online at www.scottsdaleaz.gov/codes.

B. Design Policy

A civil engineer registered in the state of Arizona is required to analyze the wastewater generation from a proposed development and determine its impact on the city's wastewater collection system. This analysis is typically required from the development to a point on the downstream system where the engineer can certify compliance with a master plan previously accepted by the city. The city is responsible for analysis of sanitary sewer lines shown in the city's Wastewater System Master Plan.

EPA REGULATIONS 7.001

The US Environmental Protection Agency (EPA) requires the city to develop and implement a program to control discharges that might harm the Publicly Owned Treatment Works (POTW). The program establishes local discharge limits for non-residential users and provides a permitting process based on the users' discharges and types of businesses. Details of the program and requirements are found in Article IV of Chapter 49 (Water, Sewers and Sewage Disposal) of the Scottsdale Revised Code. Specific information may be obtained by calling the Water Resources Department at 480-312-5685.

ADEQ REQUIREMENTS 7.002

A. Design Policy

Maricopa County Environmental Services Department (MCESD) is required to review and approve all public sanitary sewer line extensions and construction of wastewater-related facilities within the city's service area, prior to the city approving the final plans.

Engineering Bulletin No. 10, "Guidelines for the Construction of Water Systems" published by the Arizona Department of Environmental Quality (ADEQ), and Arizona Administrative Code, "Title18 - Environmental Quality," contain specific requirements for submittals, approvals, and notifications when extension of a public sanitary sewer line is proposed. Some of the provisions are outlined below. The developer is responsible for reading and complying with regulations and requirements.

1. Before Plan Review Services approves final plans, the developer will submit a cover sheet for the improvement plans with a completed signature and date of approval from the MCESD.
2. Before commencing construction, the contractor or developer will provide documentation to the city public works inspector that a Certificate of Approval to Construct and/or Provisional Verification of General Permit Conformance has been approved by MCESD.
3. Before building permits are issued, the developer will submit to the city public works inspector a Certificate of Approval of Construction and/or Verification of General Permit Conformance signed by MCESD.
4. Before Inspection Services issues a Letter of Acceptance, the developer will deliver to the city's Public Works Inspector an acceptable set of full-size 4 mil as-built mylars of the improvements.

7.003 PRIVATE WASTEWATER COMPANIES

Portions of Scottsdale's municipal service area are served by private wastewater companies. Figure 7-1 delineates these areas.

Placing private sanitary sewer lines within city rights-of-way (ROW) will require an agreement between the private wastewater company and the city.

The private company should review modifications or construction of wastewater systems within their franchise areas. When submitting final plans, the developer must provide written documentation that the private wastewater company has reviewed and approved the sanitary sewer lines within its jurisdiction.

The city cannot provide wastewater service within private wastewater company franchise areas, and will not review private wastewater systems unless requested by the owner, or for work that is to occur within the city's ROW. In cases where the city is requested to review private wastewater systems, the applicable review fees must be paid. A note must be placed on the drawings stating operation and maintenance responsibilities.

7.100 AGREEMENTS

Developers and property owners who install improvements to the public wastewater system may be eligible to request a credit, oversize, or payback agreement with the city allowing for partial reimbursement of costs to design and construct those improvements.

A. Ordinance Requirements

Developers who construct wastewater system improvements may receive credit for such construction (Section 49-74.2). The city has specific programs to provide for reimbursement agreements with developers or property owners and for the collection of line payback charges and for the oversizing of wastewater lines (Section 49-212).

7.101 CREDIT AGREEMENTS

Credit agreements are established to compensate a developer for installing system infrastructure that has been identified in the city's Capital Improvement Plan (CIP) and/or included in the most recent Development Fees Report. Credit agreements are set up through the Water Resources Department and are to be identified in the developer's master plan.

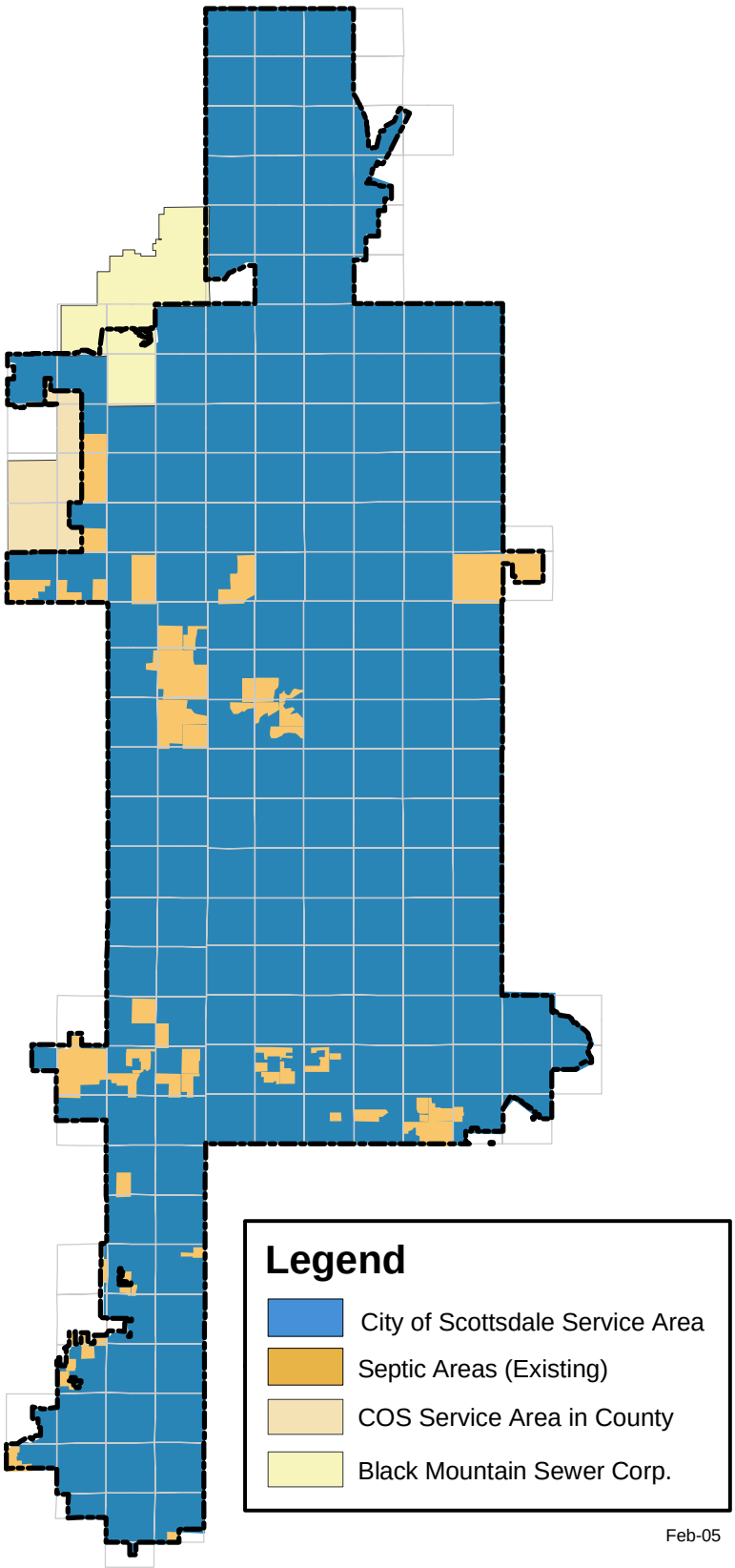

FIGURE 7-1. WASTEWATER SERVICE AREAS

7.102 OVERSIZE AGREEMENTS

Oversizing Agreements allow the city to compensate developers for the cost to install a sanitary sewer line larger than what is minimally required to serve the development. Oversizing is requested by the Water Resources Department when a larger line is necessary to meet the needs of additional properties upstream of a development. All oversizing projects involving city funds must have an oversizing agreement, and must meet all city requirements prior to plan approval and construction. The city can only participate in the cost of oversizing provided there are sufficient funds in the CIP budget, and the amount does not exceed the limitations set forth by the Arizona Revised Statutes, Title 34, Article 2, Paragraph 201.D. If sufficient funds do not exist, the oversized lines will be installed at the developer's cost. Oversizing agreements are set up through the Water Resources Department.

7.103 PAYBACK AGREEMENTS

Developers may request a Payback Agreement when constructing sanitary sewer lines across frontages of parcels not currently receiving wastewater service from the city. When a designated parcel requests wastewater service, a pro-rated cost of the sanitary sewer line is collected by the city and returned to the developer. Line extension payback agreements are set up through the Water Resources Department. For questions or details on procedures to initiate an agreement, contact the Water Resources Department.

7.104 WASTEWATER SERVICE AGREEMENT

The county's Sewer Service Agreement is to be completed by the engineer and submitted with the final plans to the One Stop Shop. Plan Review staff will sign the water and wastewater portions of the agreement and Solid Waste Management staff will sign for the refuse service. It is the owner's responsibility to obtain these signatures from the respective city divisions. The agreements will not be signed prior to the city approving the final plans. Following is specific information regarding the city's municipal wastewater system and the appropriate identification numbers:

- Water Campus – Wastewater Treatment # 37-024
- Gainey Ranch – Wastewater Treatment # 37-160
- System Name: City of Scottsdale Water Campus
- Address: 8787 E. Hualapai Dr., Scottsdale, AZ 85255

The following identification number relates directly to that portion of the city's wastewater system that is not treated at the Water Campus or Gainey Ranch. This area is generally south of Doubletree at Scottsdale Road, south of Via Linda at Pima Road, and excludes the Hayden corridor to Frank Lloyd Wright Blvd:

- General sanitary sewer collection system # 37-011

The city's Wastewater System Master Plan is helpful in determining the appropriate system identification facility number.

7.200 DESIGN REPORTS

Wastewater master plans and basis of design reports provide an analysis of the impact that a development will have on the city's wastewater system. These reports are reviewed and accepted by the Water Resources Department and then utilized by Plan Review Services to verify the infrastructure to be constructed. Accepted design reports are retained in the city's Records Division and are made available to developers and engineers upon request.

A. Design Policy

Analysis of all proposed development (determined by the city to have an impact on the wastewater system) needs to be performed by a civil engineer registered in the State of Arizona. The analysis needs to include the effects of peak flow to ensure proper sizing and layout of the proposed wastewater system facilities.

A wastewater master plan or a wastewater basis of design report is required for each development within the city when an extension of the system is necessary, or the proposed development will produce more than 10,000 gallons of wastewater per day. Water Resources staff will determine which report is appropriate for a given development and convey this requirement to the city's project coordinator for inclusion in the case's stipulations. Reports will be separately submitted for review to the One Stop Shop, directed to the attention of the Water Resources Department. The reports will be reviewed and accepted by the Water Resources Department prior to the submittal of final plans for review by Plan Review Services, unless otherwise agreed to by Plan Review staff.

WASTEWATER MASTER PLAN 7.201

A wastewater master plan is required when a change in the existing zoning or land use is proposed, phased construction is proposed, or conditions where the Water Resources Department determines one is necessary.

The objectives of a master plan are to demonstrate that the proposed wastewater system complies with the most recent update of the city's Wastewater System Master Plan, to show compliance with the city's design criteria and development policies for each phase of the project, and to establish a skeletal system for the phased development of a master planned project.

WASTEWATER BASIS OF DESIGN REPORT 7.202

Most projects within the city will require a Basis of Design Report. The objectives of a basis of design report are to determine the development's wastewater demand, to analyze the hydraulics of the proposed sanitary sewer system to a point evaluated by the city's **Wastewater System Master Plan**, and to demonstrate conformance for each phase of the development with the accepted master plan for that development.

GENERAL REPORT REQUIREMENTS 7.203

All reports submitted to the city for review must be prepared in accordance with the guidelines listed below.

A. General format

1. The report should be on letter sized paper (8 ½ x 11).
2. There should be one-inch margins on all sides.
3. The report should be bound along the left edge.
4. All reports will have a table of contents.
5. Maps and other supporting materials larger than folded ledger size paper (11 x 17) should be placed into sleeves providing an appendix to the report.
6. A civil engineer licensed to practice in the State of Arizona must seal each report.

B. Report cover

1. Covers should consist of hard stock paper or better.
2. The project name should be located on the cover.
3. The names, addresses, and phone numbers of the developer/owner and engineer should be stated on the cover.

4. The original submittal and any subsequent revision dates should be located on the cover.

C. Vicinity map

1. Identify the project's location with respect to major cross streets.
2. Identify all major existing and proposed developments within a one-mile radius.

7.204 WASTEWATER BASIS OF DESIGN REPORT CONTENT

A. Introduction

Summarize the proposed development:

1. Include a legal description based on sectional breakdown or reference within a platted development.
2. Describe the existing and proposed site zoning and land uses.
3. Include reference to elements of the city's General Plan and identify any designated character area or studies that will affect the project's design.

B. Design Documentation

Reference compliance with this manual and all other applicable standards and codes.

1. Include a discussion of which design procedures, policies, and methodologies will be incorporated into the design engineering of the wastewater system.
2. List the title and version of any software used in the design analysis.

C. Existing Conditions

1. State the existing zoning and land use.
2. Describe the existing, topography, vegetation, and landform features.
3. Include the location and description of existing utilities in the vicinity.
4. Reference any existing master plans or design reports applicable to adjacent development.
5. Indicate the results of any certified flow testing of the existing system.

D. Proposed Conditions

1. Include a site plan that indicates the layout of the proposed development.
2. Describe the proposed connection(s) to the city's wastewater system. Show extension of sanitary sewer lines into the site.
3. Address maintenance responsibilities of the proposed wastewater system.

E. Computations

1. Base wastewater flows on the design flows in this manual.
2. Verify any variance from the stated design flows with the Water Resources Department.
3. Give particular attention to wastewater peaking factors used for restaurants or specialty developments.
4. Use scour analysis where surface runoff exceeds 500 cfs over a sanitary sewer pipe.

F. Design Documentation

1. Electronic copies of all computer calculations for the wastewater analysis shall be submitted along with the final report.
2. Common spreadsheet formats shall be compatible with MS Excel.

G. Summary

1. Provide a summary of the proposed wastewater improvements stating that all the city's design standards and policies have been met, or indicate any variance or exception. Note why the developer is requesting any variance or exception.
2. Include a brief project schedule indicating the proposed start and completion of the development's improvements.

H. Supporting Maps

Include a scaled site plan showing all existing and proposed utility lines and surface improvements.

1. Graphics should screen the development's background, dash existing utilities, and present proposed utilities as bold solid lines.
2. Screen existing topography into the background. Clearly label, at two-foot intervals, all existing and proposed contour intervals. Show sufficient information to evaluate pipe cover.
3. Show, dimension, and label clearly all property lines, rights-of-way, tract, and easement lines.

I. Miscellaneous

Requests for more specific information regarding report requirements and the wastewater system may be obtained by contacting the Water Resources Department.

WASTEWATER MASTER PLAN REPORT CONTENT 7.205

1. The Wastewater Master Plan Report will specify the terms and requirements for wastewater service to the development.
2. All development projects will be responsible for determining their specific wastewater discharge and will include flow from any upstream developments to ensure the system is designed properly.
3. If the proposed development requires a change in zoning, which increases density, or proposes a wastewater system different from the city's existing Wastewater System Master Plan, then additional off-site calculations will be required.
4. Flows will be calculated according to this section.
5. A computer disk containing all calculations will be submitted along with the Master Plan report.
6. Each Master Plan map must show the following:
    a. All proposed on-site and off-site facilities including, but not limited to, lift stations, trunk lines, and collection lines.
    b. Proposed street locations, parcel boundaries and proposed lots within each parcel.
    c. Contour lines at two-foot intervals showing the elevation of the land surface.
    d. A separate area location map showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of one mile from the exterior boundaries of the project. Assessor's maps can provide the information required to prepare these composite maps.
    e. A scale that is sufficient to show all required information clearly.
7. All sanitary sewer lines that cross golf courses or other open areas must do so within established roads. If dedicated roads are not practical, then the crossing must be within a 20-foot-wide accessible easement within a tract. No walls may cross these easements.

8. The Wastewater Master Plan must show compliance to construct sanitary sewer lines, if not already in place, across all dedicated frontages of the development where future extension is possible.
9. A construction schedule will be included in a table format for all wastewater related construction required to serve the development. The schedule will have each phase or parcel as column headings and each construction project or system component as rights-of-way (ROW) headings. A mark in each box will specify when each constructed item will be required for each phase of the development.
10. The master plan report must comply with the adopted city Wastewater System Master Plan encompassing the respective area.
11. Those Master Planned Developments that design a wastewater collection system that will be phased will provide a description of the phasing.

For specific information regarding wastewater plan requirements and/or the city's current Wastewater System Master Plan, contact the Water Resources Department.

7.300 WASTEWATER FACILITIES

Lift stations and force mains are typically designed and constructed by the city through its Capital Improvement Program. Developers needing to construct these facilities must contact the Water Resources Department and request a meeting. The developer should be prepared to address how the proposed system will conform to the city's Wastewater System Master Plan. The city will address design issues, the city's review process for wastewater facilities, and any potential city cost participation.

A. Ordinance Requirements

When wastewater service is not available, a septic system or alternative system acceptable to the Water Resources Department may be allowed with the approval of both the city of Scottsdale and the Maricopa County Environmental Services Department (Section 49-116).

B. Design Policy

Maricopa County Environmental Services Department and the city discourage the development of privately owned packaged treatment facilities designed to serve two or more lots.

Where lift stations are necessary, the engineer will meet with the Water Resources Department to discuss design requirements, ownership, and maintenance responsibilities.

7.301 SEPTIC SYSTEMS / ONSITE TREATMENT FACILITIES

The property owner is responsible for the design, construction, operation, and maintenance of septic systems / onsite wastewater treatment facilities. The city will not accept any type of onsite system for operation and maintenance.

All onsite wastewater treatment facilities will be designed and constructed compliant with the applicable requirements of the Maricopa County Environmental Services Department. Final plans submitted to the One Stop Shop will include the county's permit number for the onsite system.

7.302 WASTEWATER LIFT STATIONS

Water Operations maintains a separate document outlining the design, specifications, and materials required for a city owned and maintained wastewater lift station. Contact the Water Resources Department for current information.

A. Site Selection

In selecting a site for a sewage lift station, consider accessibility, drainage patterns, visual impact, function, and design constraints.

Consider the potential for flooding when selecting a pump station location. The station's equipment must be protected from damage and remain operable during a 100 year flood.

Unless otherwise agreed to in writing by the city's Rights-of-Way Agent, each tract or lot dedicated to the city will be conveyed by a general warranty deed, and accompanied by a title policy in favor of the city, both to the satisfaction of city.

B. Lift Station Design

Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control," contains minimum requirements for a wastewater lift station. Additional requirements specific to the city must be obtained from the Water Resources Department before beginning design. At a minimum, telemetry, dual pumps, backup power supply, three-phase power, odor control, and perimeter walls will be required. The site will also be large enough to contain all the equipment and service equipment for repairs.

Prior to the preparation of construction drawings, a preliminary basis of design report will be prepared and submitted to the One Stop Shop for Water Resources Department review. The preliminary report will outline the type of equipment and controls proposed for the station. A final basis of design report prepared by a registered professional engineer licensed in the State of Arizona must accompany all pump station design drawings submitted to the city for review.

FORCE MAINS 7.303

Force mains will be located within a rights-of-way, private street tract, or utility easement. The line must be located under pavement where possible.

A. Velocity Requirements

The flow velocity in the force main must be between 4 and 6 fps.

B. Materials of Construction

All pipe material used in design of the force mains must have established ASTM, ANSI, AWWA, and NSF standards of manufacture, or seals of approval, and shall be designated as pressure sanitary sewer pipe. Force mains must be identified as such with marking tape 1 foot above the pipe.

C. Air Release Valves

Air release valves designed for sewage must be provided on force mains at all peaks in elevation. See COS Standard Detail No. 2405.

D. Cleanouts

Two-way cleanouts shall be provided every 1,300 feet apart or one-way cleanouts every 650 feet. Single cleanouts must be provided at all horizontal bends, oriented in line with the downstream pipe. See COS Standard Detail No. 2403.

E. Force Mains

Force mains will be constructed of restrained ductile iron pipe for the following conditions:

1. All locations where a vertical realignment is required;
2. Drainage wash crossings;
3. Air release assemblies;
4. Clean-out assemblies.

F. Line Separations

1. Where a force main crosses a water main or transmission line, protection must be provided as per ADEQ Engineering Bulletin No. 10 and the Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control." At a minimum, the force main should be constructed of ductile iron pipe for a distance of 10 feet on each side of the water line.
2. See COS Standard Detail No. 2402 for details regarding discharge into a manhole from a force main.
3. The minimum separation between the force mains and water lines should be 2 feet wall-to-wall vertically and 6 feet horizontally under all conditions. Where a force main crosses above, or less than 6 feet below a water line, the force main shall be encased in at least 6 inches of concrete for 10 feet on either side of the water line. Fittings should not fall within the encasement.

The engineer must evaluate the potential for odor to develop from a force main downstream of the receiving manhole. One-way valves on building service lines shall be specified where there is potential for gasses to strip from the waste stream. The valves should be located at or near the building cleanout and include provisions for access and maintenance by the property owner.

7.400 COLLECTION SYSTEM

This section describes the minimum requirements for extending the public wastewater collection system.

A. Ordinance Requirements

Sanitary sewer lines are required along the entire length of property line frontage whenever future extension of the wastewater system is possible. The property line frontage is that portion of the property that abuts a street, public utility easement, or public rights-of-way. If a parcel to be developed has more than one property line frontage, the city may require a sanitary sewer line be installed along the entire length of all frontages (Section 49-219).

Developers must install, at their expense, all on-site and off-site improvements necessary to serve their developments. This expense includes all required development fees (Section 49-73).

Onsite sanitary sewer lines to commercial shopping center developments must be privately owned, operated, and maintained. Multifamily developments may elect to install public or private sanitary sewers (Section 49-118).

When required by the city, users who discharge non-residential wastewater must install monitoring manholes (Section 49-96). Users discharging industrial wastes must install monitoring manholes and provide written notice to the Water Resources Department (Section 49-161).

B. Design Policy

When a public sanitary sewer line is located within 660 feet of the boundary of the subject property, extend the line to provide service to the property. A private onsite wastewater treatment system may be constructed only when a public wastewater system is not available.

Sanitary sewer lines will not be privately owned if future connections to those lines would be necessary to serve adjacent parcels.

For planned developments and subdivisions where an existing sanitary sewer is not available, a dry sanitary sewer line must be installed conforming to all the design requirements for a public sanitary sewer line. Use a permanent marking system to locate

the capped ends of service line stubs on a dry system. Also, design interim onsite wastewater treatment systems for future connection to the dry system when sanitary sewer service becomes available.

Wastewater systems must be designed to serve the ultimate population density expected in the tributary area. Make sure the design is in conformance with the current city approved Wastewater System Master Plan and takes into consideration future connections. Where a wastewater collection system extension is possible upstream of a subdivision, extend the sanitary sewer through the subdivision to the platted boundary for a point of connection that will provide wastewater service to adjacent properties.

C. Design Standards

The engineer should be familiar with the Maricopa Association of Government's Uniform Standard Specifications for Public Works Construction and the COS Supplement to MAG Uniform Standard Specifications for Public Works Construction, including all applicable Standard Details. These documents contain construction related specifications and details that impact the design of water systems including trenching, bedding, backfill, pavement replacement, etc.

Private wastewater systems must be designed in compliance with Arizona Administrative Code, Title 18, Chapter 9, "Water Pollution Control".

MATERIALS 7.401

In selecting pipe material for sanitary sewer lines, give consideration to chemical characteristics of the wastewater (especially for industrial wastes), velocity, the possibility of septicity, external and internal pipeline forces, and preventing infiltration, abrasion, and similar problems.

Use sanitary sewer lines that are vitrified clay pipe (VCP), polyvinyl chloride (PVC) SDR35 up to 15 inches diameter, PVC meeting ASTM F679 - T1 between 18 and 27 inches diameter, or ductile iron pipe (DIP) with approved interior and exterior linings. Submit in writing to the Water Resources Department any requests for consideration of alternative materials.

Do not change pipe material between manholes.

Where standard strength pipe is not structurally sufficient due to external loading, or 4 feet of pipe cover cannot be maintained, submit a written request, along with supporting calculations, to the Water Resources Department for permission to use extra-strength pipe, special bedding specifications, or alternative construction methods. The Water Resources Department must accept the request, in writing, prior to Plan Review Services approval of the final plans.

Ensure that all types of pipe material used in design have established ASTM, ANSI, or NSF standards of manufacture or seals of approval, and are designated for use for wastewater.

SYSTEM LAYOUT 7.402

Generally, sanitary sewer lines constructed along a street grid should be aligned parallel to, and south or west of, the street centerline. Lines should not cross the street centerline except in cases where curvilinear roadway alignments are encountered.

Public sanitary sewer lines within commercial, industrial, or multi-family developments must be located within drive aisles a minimum of 6 feet from any structure. Public sanitary sewer lines will be located within tracts and/or public utility easements. No private utilities are allowed longitudinally within a public utility easement.

If the horizontal direction, slope, material, or size of the sanitary sewer line changes, a manhole must be constructed. The horizontal angle formed between the two lines cannot

be less than 90 degrees. In sanitary sewer lines that are 12 inches or larger, angles formed must be between 120 and 150 degrees to the downstream pipe, for odor control purposes.

Curvilinear sanitary sewer lines will not be allowed.

Wastewater flows shall not pass through collection systems that have not been accepted by the city.

Developments with numerous curved streets will be discussed with the Water Resources Department to decide whether the city will consider a design report with water and sewer layouts in accordance with the following criteria:

1. Water and sanitary sewer lines will be placed under the paved section of the roadway within the area, from back of curb to back of curb.
2. Sanitary sewer lines must maintain a minimum of 3 feet horizontal clearance to dry utilities.
3. Sanitary sewer manholes are to be located at the approximate center of the drive lane.
4. The water line and sanitary sewer line will run parallel to each other, with 9 feet of separation to the pipes' centerline in order to maintain 6 feet of clearance at manholes.
5. Deflections in the sanitary sewer line shall be designed to nominal fitting angles within standard tolerances and will occur at the same locations where the water line is deflected.
4. Reference Section 6.402 for related water system criteria.

7.403 DESIGN FLOWS

A. Residential

Sanitary sewer lines 8 to 12 inches in diameter will be designed using 100 gallons per capita per day (gpcpd) and a peaking factor of 4.

Sanitary sewer lines larger than 12 inches in diameter will be designed using 105 gpcpd and a peaking factor developed from "Harmon's Formula":

$$Q_{max} = Q_{avg} [1+14 / (4+P1/2)]$$

P = Population / 1,000

Residential densities are to assume 2.5 persons per dwelling unit, apartment, or town home.

B. Commercial and Industrial

Commercial and industrial flows will be based upon known regional data or accepted engineering reference sources, approved by the Water Resources Department.

7-404 HYDRAULIC DESIGN

No public sanitary sewer lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

Sanitary sewer lines should be designed and constructed to give mean full flow velocities of not less than 2.5 fps, based upon Manning's Formula, using an "*n*" value of 0.013.

Conversely, to prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, the line should be constructed of DIP, and lined. In no case will velocities greater than 15 fps be allowed.

Actual velocities will be analyzed under peak flow conditions for each reach of pipe.

Generally, the sanitary sewer system will be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope should be evaluated for hydraulic jump.

The depth to diameter (d/D) ratio for gravity sanitary sewer pipes 12 inches in diameter and less should be no greater than 0.65 in the ultimate peak flow condition. The d/D ratio for gravity drains greater than 12 inches diameter should be no greater than 0.70 for the ultimate peak flow condition.

Mitigation of hydrogen sulfide will be analyzed in the design report and be provided for in the design of the system.

MANHOLES AND CLEAN OUTS 7.405

Manholes in city streets should be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes should not be located in bike trails, equestrian trails, sidewalks, crosswalks, or wash crossings. Manholes are required at all changes of grade, pipe size, pipe material, or alignment, and at distances not to exceed those shown below:

Pipe Diameter (inches)	**Maximum Manhole** Spacing (feet)
8 – 15	500
18 – 30	600
36 – 60	800
Over 60	1,300

FIGURE 7-2. MANHOLE SPACING

A. Manhole Base

Manhole bases are to be cast in place. The flow channel through the manhole should be steel trowel finished to conform in shape and slope to that of the sanitary sewer pipe. The manhole shelf should be brush or broom finished, with a slope of one inch per foot. The manhole bottom should be filleted to prevent solids depositions, and channeled to ensure satisfactory flow to the lower invert.

B. Manhole Sections and Cones

All manhole sections and cones should be the precast concrete as detailed in the MAG Standard Detail No. 420, deleting the manhole steps and/or cast in anchors for steps.

If a manhole is more than 10 feet deep or the line is 15 inches in diameter or larger, the manhole should be 5 feet in diameter. Manhole depth shall be defined as the distance from the design rim elevation to the lowest invert elevation.

C. Manhole Covers

Manhole covers are to be per MAG Standard Detail No. 424 and COS Standard Detail No. 2421.

D. Manhole Linings

Manholes will be lined or coated at the junction of a force main, when constructed on sanitary sewer lines 15 inches in diameter or larger, or in other design situations where corrosive conditions are anticipated. Manholes receiving wastewater from force mains and ejector lines must be lined. Manholes requiring linings or coatings shall be noted on the final plans.

E. Intersecting Lines within Manholes

Manholes are required for all lines intersecting at angles other than 180 degrees, a change in slope, a change in pipe size, or a change in pipe material. The manhole must have a minimum 0.10-foot drop across the trough unless otherwise approved by the Water Resources Department. Where pipe size changes through a manhole, the top invert of the upstream pipe(s) will be equal to or higher than the top invert of the downstream pipe. In large trunk lines, inverts at junctions should be designed to maintain the energy gradient across the junction and prevent backflow.

F. Drop Manholes

If the difference in invert elevations between inflow and outflow lines exceeds one pipe diameter, a drop connection must be installed. Drop connections shall be in accordance with MAG Standard Detail No. 426, modified as follows:

- For drops up to and including 5 feet, use Type "A" drop connections.
- For drops greater than 5 feet, use Type "B" drop connections.

The manhole bottom should be filleted to prevent solid deposition.

G. Manholes at Washes and Drainage Areas

Manholes must be protected from storm drainage and flooding conditions. Sanitary sewer lines will not be allowed in washes or drainage areas unless otherwise approved in writing by the Water Resources Department.

When approved by the city, manholes located within washes or drainage areas are to have bolted watertight covers to prevent inflow, and the rim elevation should be a minimum of 18 inches above adjacent finish grade (see COS Standard Detail No. 2420). Design watertight manhole bases, barrels, and grade rings, and provide structural protection against scour from a 100 year storm flow. This protection may require encasing the entire manhole using sono-tube form material, or constructing a monolithic manhole. The manhole should be designed by the engineer to meet the amount of protection as calculated by the flow conditions of the wash. The engineer is responsible to provide a manhole design eliminating infiltration in wash areas.

H. Cleanouts

Cleanouts per MAG Standard Detail No. 441 may be used in place of manholes at the ends of laterals that cannot be extended and are less than 150 feet in length. Cleanouts are required to allow for maintenance and inspection of the lines.

Service connections are not allowed at the ends of cleanouts. Service connections should be provided off the sanitary sewer line a minimum of 2 feet downstream of the cleanout.

7.406 MONITORING VAULTS AND MANHOLES

A. Monitoring Vaults

The Water Quality Division has sole discretion when to require a developer to install a monitoring vault for testing wastewater flow and composition. Generally, properties in industrial land use/zoned areas with a projected wastewater discharge of 25,000 gallons per day will be required to install a monitoring vault per COS Standard Detail No. 2460 (www.scottsdaleaz.gov/design/detaildrawings).

B. Monitoring Manholes

The Water Quality Division has sole discretion when to require a developer to install a monitoring manhole. Generally, commercial properties with potential mixed uses, restaurants, and developments that will use chemicals or solvents are required to install monitoring manholes.

Monitoring manholes will be constructed per MAG Standard Detail No. 420, with a straight channel and no taps or bends for 10 feet upstream or downstream, or as approved by the Water Resources Department. Design details for monitoring manholes on sanitary sewer lines 6 inches or larger with a peak flow greater than 40 gpm must be approved by the Water Resources Department.

Monitoring vaults and manholes will be located in a minimum 16-foot-wide easement that extends from the manhole to the existing public wastewater system, and be designed for access at all times to monitoring crews and vehicles.

PIPE COVER AND SEPARATIONS 7.407

Sanitary sewer pipe will be installed at a depth sufficient to ensure gravity drainage of wastewater from each service line, and should anticipate the lowest potential finish floor elevation for each building pad.

Pipe design should ensure gravity drainage from the ultimate drainage area, and will allow for future extensions of service to adjacent parcels.

In no case will sanitary sewer lines be installed with less than 4 feet of cover over the top of the pipe, unless otherwise approved by the Water Resources Department.

All sanitary sewer lines will be designed to absorb superimposed live loads and backfill overburden without damage to the pipe material and without adversely affecting the hydraulic characteristics of the pipe. The Engineer will specify minimum depths of cover to be provided during the construction of roadways or other facilities affecting cover over the line.

A. Separation of Water and Sanitary Sewer lines

Caution should be taken in the design and construction of the sanitary sewer lines to protect all water supplies from wastewater contamination. To minimize the potential of contamination, the engineer must design the horizontal and vertical separation of water and sanitary sewer lines in accordance with **Engineering Bulletin No. 10**, "Guidelines for the Construction of Water Systems" published by the Arizona Department of Environmental Quality, and the **Arizona Administrative Code**, Title 18, Chapter 9, "Water Pollution Control".

The minimum horizontal distance from a water line to a sanitary sewer line will be 6 feet, wall-to-wall. The minimum vertical clearance of a water line crossing under a sanitary sewer line will be 18 inches. Water lines crossing over a sanitary sewer line should provide 2 feet of minimum vertical separation.

Where conditions prevent adequate vertical separation, or where a water line must cross under a sanitary sewer line, both the water and sanitary sewer lines will be constructed of ductile iron pipe (pressure class 350) with mechanical restraining joints.

Where the sewer line cannot be taken out of service, the Water Resources Department may allow the existing sanitary sewer lines to be encased in concrete, in lieu of replacing them with ductile iron pipe.

B. Separation from Structures

Sanitary sewer lines will have a minimum of 6 feet of horizontal clearance from any structural footing or substantial improvement. Design will consider any structural load imposed on the pipe.

The Water Resources Department may consider an indemnity agreement where no alternative sewer alignment is possible and surface improvements, including decorative paving or screen walls, are to be located within 6 feet of the sanitary sewer line. If an indemnity agreement is acceptable to the Water Resources Department, boilerplate language for an indemnity agreement will be provided with final plans review.

C. Separation from Other Utilities

See COS Standard Detail No. 2372.

D. Separation from Storm Drains and Culverts

Sanitary sewer lines crossing less than 2 feet below a storm drain or culvert, or under large structures such as box culverts and bridges will require additional protection such as the use of ductile iron pipe or encasement. Sanitary sewer lines crossing over storm drains and culverts must be a minimum of 1 foot above and be adequately protected.

7.408 WASH CROSSINGS

All wash crossings will be constructed using restrained joint Class 350 ductile iron pipe coated per specification. Bury requirements to place sanitary sewer lines under washes or channels will be based upon the 100-year peak design discharge (Q_{100}) in the channel or wash. The minimum depth of bury below the design flow line of the channel or wash.

100 year flow rate	Minimum depth of bury
1 to 49 cfs	5 feet
50 to 99 cfs	6 feet
100 to 499 cfs	7 feet
Greater than 499 cfs	Scour depth based on scour analysis required

FIGURE 7-3. WASH CROSSINGS – MINIMUM DEPTH OF BURY

Wash crossings with a 100 year flow above 500 cfs will have the scour depth estimated using **Arizona State Standard Attachment SSA 5-96**, Guideline 2, Level I, as published by the Arizona Department of Water Resources. The engineer will estimate the depth of scour and design the top of pipe to be 3 feet below the estimated scour depth. The engineer will provide a detailed analysis of the scour depth with final plans for review and approval.

All pipelines that must be located within the scour zone, or with less than the minimum required depth of bury as indicated above, will be protected by installing a cut-off wall downstream of the pipeline to stabilize the scour depth to a minimum of 3 feet above the pipeline. The engineer will design the cut-off wall and include details on the improvement plans. Plan Review Services will review pipe protection and scour stabilization requirements on a case-by-case basis.

7-409 GRAVITY SANITARY SEWER SERVICE CONNECTIONS

The engineer will make every effort to use existing sanitary sewer lines that have been stubbed out to a property by previous construction. Where the use of stubbed out lines is not feasible, the existing line will be abandoned and capped at the sanitary sewer main. If the existing service line is connected to a manhole, the trough of the manhole will be rebuilt to conform to the active lines.

A. Minimum Diameters for Service Lines

- Residential: 4 inch
- Multi-family: 6 inch
- Commercial: 6 inch

B. Installation

All service line connections will be installed perpendicular to the sanitary sewer line, in accordance with COS Standard Detail No. 2440, and extended to the back of the public utility easement and marked. Within the rights-of-way or easement, no bends in the service line will be allowed.

C. Location

1. All proposed service line connections will be shown on the final plans with stations and dimensions, or offsets, from street centerline. Typical separation dimensions from the water service lines shall be shown. Each lot or building must be provided with its own individual service line unless otherwise approved in writing by the Water Resources Department.
2. The service line location should be coordinated to avoid conflicts with other utilities, with driveway locations, and should be located within the downstream 1/3 of the fronting sanitary sewer line length.
3. Because water lines are located behind the curb in many locations, conflicts with sanitary sewer service lines are possible. Sanitary sewer lines should be designed to allow for the sanitary sewer service lines to pass under water lines with 12 inches of vertical clearance to minimize potential health hazards.
4. When it is not possible to maintain sufficient vertical clearance, or the sanitary sewer service line will pass over the water main, the sanitary sewer service line must be encased in concrete of 6 inches minimum thickness to 6 feet from each side of the crossing, or ductile iron pipe must be used for the same distance. See MAG Standard Detail 404-2.

D. Service Line Connection to Large Diameter Sanitary Sewer Lines

Sanitary sewer lines 15 inches in diameter, or larger, may be tapped only with a manhole. Service lines into manholes may be angled, but the flow line of the service line should not be more than 4 inches below the crown of the sanitary sewer line.

E. Service Line Connections into Manholes on Small Diameter Sewer Lines

No more than 4 service lines may be made into any manhole on a sanitary sewer line 14 inches in diameter, or smaller, without written approval from the city. Sanitary sewer service line inverts will be not be more than one service line pipe diameter above the crown of the downstream sanitary sewer line in the manhole.

F. Service Line Connections at Cleanouts

Sanitary sewer service connections will be located a minimum of 2 feet downstream of the cleanout structure.

G. Maintenance

The property owner receiving wastewater service is responsible for maintenance of the sanitary sewer service line including the wye connection to the public main.

PRESSURIZED SANITARY SEWER SERVICE CONNECTIONS 7.410

Pressurized sanitary sewer ejector systems will be owned, operated, and maintained by the property owner. The property owner's civil engineer is responsible for the design and hydraulic analysis of the pressurized system.

A. Connection of Individual Ejector to Adjacent Gravity Sanitary Sewer Line

The sanitary sewer service line constructed within the rights-of-way will be per COS Standard Detail No. 2440. The pressurized line will connect into the gravity service line

outside of the rights-of-way, and if applicable, the adjacent public utility easement. Connection to the gravity service line will be at a cleanout connection.

B. Connection of Individual Ejector(s) Downstream of a Property

The city does not support extending private pressurized ejector lines across the frontages of adjacent lots or properties. The developer or property owner will request a meeting with the Water Resources Department to discuss available options. One potential option is for the developer or owner to design and construct a segment of a public gravity collection system within the public rights-of-way, or private street tract, and a lift station at the low terminus of the segment.

Water Resources approves the extension of individual private ejector lines across the frontages of adjacent properties in the following places:

1. Private manholes receiving wastewater from ejector lines (the first downstream public manhole shall be coated or lined to prevent corrosion).
2. Individual ejector lines from parcels shall be run within a private sewer easement, adjacent to any public rights-of-way and utility easement. Spare conduits shall be provided, and clearly labeled on a plan detail, in the event a line becomes plugged or damaged.
3. Where individual ejector lines exceed 600 feet in length or have retention times exceeding 3 hours, the engineer will evaluate the potential for odor problems. The city will not accept odor-absorbing materials in basket containment, placed within manholes. Odor management will be incorporated through the use of biofiltration processes.

7.411 GREASE, OIL, AND SAND INTERCEPTORS

Grease, oil, and sand interceptors will be provided for laundries, restaurants, automobile service facilities, car washes, and other similar facilities. The engineer will contact the Water Quality Division to determine if an interceptor is required, and which type of interceptor is best suited for the proper handling of liquid wastes. Interceptors will be installed and maintained by the owner and made accessible to the city. For more details, contact the Water Quality Division.

7.412 TRACT AND EASEMENT REQUIREMENTS

All public sanitary sewer lines located outside the public rights-of-way or a private street tract must be placed within a minimum 20-foot easement located within a dedicated tract (portion of a utility tract, drainage tract, or open space tract), unless approved otherwise by the Water Resources Department. The sanitary sewer line shall be located a minimum of 6 feet from the edge of the easement. The easement will be accessible from a public rights-of-way, will be free of obstructions, will not be located within a fenced area, and will be accessible at all times to city service equipment such as trucks, backhoes, etc. Areas in question will be approved in writing by the Water Resources Department.

Sanitary sewer line easements, located outside of paved areas, will have a 10-foot-wide hardened path with a cross-sectional slope not greater than 10 percent. The hardened path will consist of native soil compacted to 95 percent to a depth of 1 foot from the existing or design surface, whichever is lower. Any revegetation within the easement will consist of low growing shrubs or plant material acceptable to the Water Operations Division. Trees may be located along the edge of the easement but not within 7 feet of the sanitary sewer line as measured to the trunk of the tree.

Locating a public sanitary sewer line on private property within a public utility easement but without dedicating a tract will require written permission from the Water Resources Department.

A copy of any written approval from the Water Resources Department shall be submitted with the final plans.

EASEMENT ABANDONMENT REQUIREMENTS 7.413

When a property owner or developer believes a sanitary sewer line easement, or portion thereof, is no longer required by the city, an abandonment may be requested by completing and filing an application through the city's One Stop Shop.

After completing and filing the application, the property owner or developer will send a letter requesting abandonment of the easement, along with the reason, to the Water Resources Department with the following exhibits attached:

1. A detailed map highlighting the easement to be abandoned, and locations of existing water and sewer lines shown in reference to the easement.
2. If existing water and/or sewer lines are to be abandoned, a detailed civil plan prepared by a professional engineer licensed in the State of Arizona must be supplied describing the method of abandonment and any necessary relocations of the water and/or sewer lines.
3. The Water Resources Department will issue a letter recommending approval or denial of the abandonment request and any stipulations that may be required in conjunction with the abandonment.
4. This letter will be attached to an Application for Release of Easement and will be submitted by the applicant to the One Stop Shop for subsequent processing by Development Services.

Failure to comply with the above process will result in a denial of the request. Where replacement rights are requested by the city, the city will not relinquish existing rights until the replacement rights have been granted.

PRIVATE SANITARY SEWER LINES 7.414

Private sanitary sewer lines must meet the Maricopa County Environmental Services Department and the city of Scottsdale Building Inspection Services requirements for approval. Privately owned and maintained sanitary sewer lines shall not be located in the street rights-of-way or a in a public utility easement.

Wastewater collection systems within commercial properties will be designed as private system per the **Uniform Plumbing Code** and **Arizona Administrative Code**, Title18, Chapter 9, "Water Pollution Control".

ALTERNATIVE SANITARY SEWER SYSTEMS 7.415

Developers or property owners may request that the Water Resources Department consider the design of alternative wastewater systems upon their engineer's determination that conventional gravity or forced sanitary sewer systems cannot provide adequate service to the development. Contact the Water Resources Department for information regarding alternative sewer designs.

If an alternative wastewater system is acceptable to the Water Resources Department, the design concept will then be coordinated with the Maricopa County Environmental Services Department for their input.

FINAL PLANS PREPARATION 7.500

Construction Plan Submittal Requirements for the preparation of final plans in the city are described in Chapter 1; this section supplements the requirements of Chapter 1.

A. Ordinance Requirements

Upon development of property for which city wastewater service is desired and available, the developer shall submit a plan for the wastewater system prepared by a professional engineer licensed in the State of Arizona (Section 49-122).

B. Design Policy

Any variance to these standards will require written permission from the Water Resources Department.

C. Design Standards

Any project specific notes that apply to construction on the city's wastewater system are required on each set of final plans that include improvements to the city's wastewater system or a wastewater system that is to be dedicated to the city.

7.501 SPECIFIC SEWER PLAN REQUIREMENTS

The following paragraphs highlight requirements for the preparation of wastewater final plans that are to be submitted to the city for approval.

1. All sanitary sewer lines will be shown in both plan and profile and pipe material called out.
2. Each manhole will have a unique identifier and be labeled in both plan and profile.
3. Sanitary sewer line stationing will be along the centerline of the pipe.
4. Concrete encasement will be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.
5. If a line is to be connected to an existing system, the following note should be placed on the final plans: "Contractor shall verify the location of the existing sanitary sewer line before proceeding with trenching."
6. Both slope and elevation must be shown on all proposed sanitary sewer lines stubbed out for future extension.
7. Where sanitary sewer lines cross water lines, storm drains, or drainage culverts, the clearances will be shown in profile.
8. For permitting purposes, quantities for all items of work within the public rights-of-way and public utility easements will be included on the cover sheet of the final plans.
9. Sanitary sewer service line invert elevations will be called out for all final plans. All service line connections shall be shown on the final plans with the ends of any capped service lines located by station, offset, or dimension.
10. The drawings will show all utility locations, sizes, easements, rights-of-way, and other structural features affecting the sanitary sewer line.
11. Lift station plans will show all invert elevations, structural elevations, existing and finished grades, control setting elevations, structural design of the wet well and dry well, valves and piping, surge control devices, pump suction and discharge details and any other details necessary to provide construction of the design.
12. Plans and profiles of force mains will show size, invert and grade elevations, material, existing and proposed utility locations, and any other necessary details.
13. Private and dry sanitary sewer lines will be noted as such on the final plans set. The responsibility for operation and maintenance of private sewer systems will be stated on the final plans.
14. Easements within tracts will be shown and labeled in plan view. Existing County recording numbers shall be shown on the final plans.

15. Final plans must comply with any design review or preliminary plat stipulations and any accepted wastewater basis of design report.

All plan documents for sanitary sewer lines and/or wastewater treatment works will be prepared by a registered civil professional engineer licensed in State of Arizona under the provisions of ARS 32:141-145.

Additional requirements for the preparation of final plans in the city are presented in Chapter 1 of this Manual.

REVIEWS AND APPROVALS 7.502

All final plans that include work on the city's wastewater system, or on a system which is to be dedicated to the city, must be submitted to the One Stop Shop for review. Plan review fees must be paid at the time of plan submittal.

No final plans will be submitted unless accompanied by a copy of the accepted basis of design report, when one is stipulated for the project. If master plans or basis of design reports are being submitted as part of a development review board or preliminary plat package, they should also be submitted separately through the One Stop Shop for review by the Water Resources Department.

Maricopa County Environmental Services Department approval is required prior to approval of final plans by Plan Review Services. No permits for improvements to the public wastewater system will be issued until the owner or developer has provided all necessary easements and rights-of-way. These instruments of dedication must be approved and submitted to the city for recording at the Maricopa County Recorder's Office.